AD8159 Evaluation Board Application Guide

EVAL-AD8159-AC/DC

FEATURES

Facilitates evaluation of the AD8159
Either ac- or dc-coupled versions
Optimized layout

GENERAL DESCRIPTION

The AD8159 evaluation board consists of 24 differential 100 Ω microstrip traces on the top layer with side launch SMA connectors. A 10 inch differential microstrip test trace is routed on the bottom layer. Toggle switches are used to select logic high and logic low for the individual control signals. The AD8159 evaluation board is available in either an ac-coupled or dc-coupled version (AD8159-EVAL-AC or AD8159-EVAL-DC). The ac-coupled evaluation board has ac-coupling capacitors installed on all of the gigabit serial I/O ports.

Refer to the AD8159 data sheet in conjunction with this document.

FUNCTIONAL BLOCK DIAGRAM

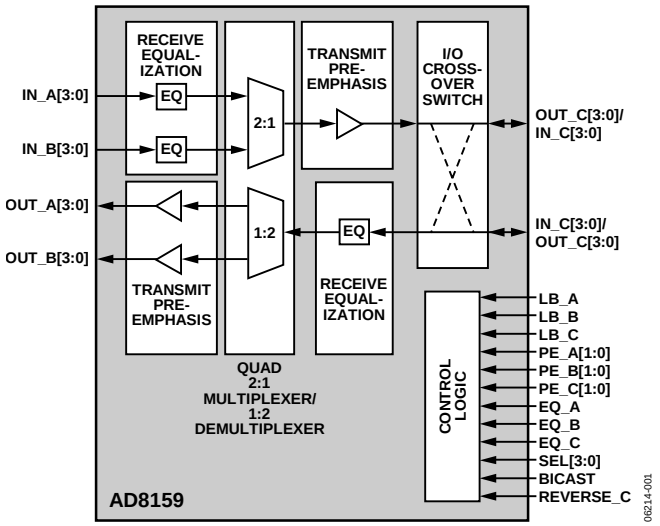

Figure 1. AD8159 Block Diagram

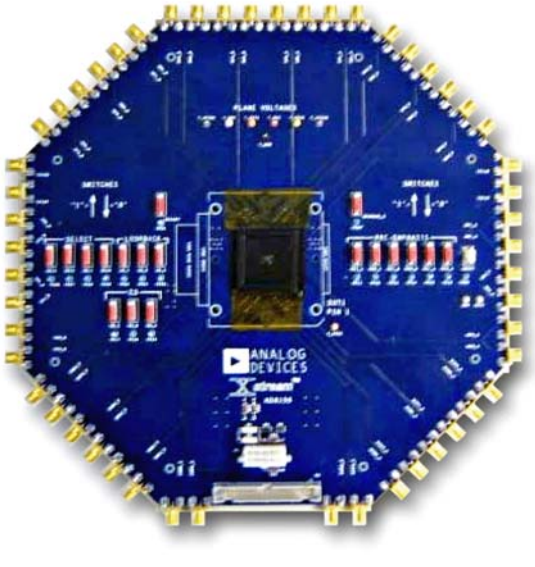

Figure 2. AD8159 Evaluation Board

Rev. 0

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REVISION HISTORY

3/07—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

CONTROL INTERFACE

The AD8159 is controlled by 19 individual switches summarized in Table 1. When a toggle switch is in the up position, a Logic 1 is placed on the respective signal. Conversely, a switch in the down position places a Logic 0 on the respective signal. All signals are active high unless otherwise specified. Refer to the AD8159 data sheet for a detailed description of device functionality. Signals on the board labeled SER, SCLK, and RESET are for ADI internal use only.

Table 1. Summary of AD8159 Evaluation Board Control Signals[1]

Signal	Description	Function
SEL0	A/B select for Port 0	0 selects Port A. 1 selects Port B.
SEL1	A/B select for Port 1	0 selects Port A. 1 selects Port B.
SEL2	A/B select for Port 2	0 selects Port A. 1 selects Port B.
SEL3	A/B select for Port 3	0 selects Port A. 1 selects Port B.
EQ_A	Equalization setting for A	0 sets input Port A for low EQ. 1 Sets input Port A for high EQ.
EQ_B	Equalization setting for B	0 sets input Port B for low EQ. 1 sets input Port B for high EQ.
EQ_C	Equalization setting for C	0 sets input Port B for low EQ. 1 sets input Port B for high EQ.
REVERSE_C	Reverse C enable	0 sets Port C I/O pins to input and O/I pins to output signals. 1 sets Port C I/O pins to output and O/I pins to input signals.
BICAST	Bicast enable	0 sets the mux in unicast mode. 1 sets the mux in bicast mode.
PE0_A	Pre-emphasis LSB for A	PE_A [1:0] = 00 sets PE on output Port A to no pre-emphasis. PE_A [1:0] = 01 sets PE on output Port A to low pre-emphasis. PE_A [1:0] = 10 sets PE on output Port A to mid pre-emphasis. PE_A [1:0] = 11 sets PE on output Port A to high pre-emphasis.
PE1_A	Pre-emphasis MSB for A	
PE0_B	Pre-emphasis LSB for B	PE_B [1:0] = 00 sets PE on output Port B to no pre-emphasis. PE_B [1:0] = 01 sets PE on output Port B to low pre-emphasis. PE_B [1:0] = 10 sets PE on output Port B to mid pre-emphasis. PE_B [1:0] = 11 sets PE on output Port B to high pre-emphasis.
PE1_B	Pre-emphasis MSB for B	
PE0_C	Pre-emphasis LSB for C	PE_C [1:0] = 00 sets PE on output Port C to no pre-emphasis. PE_C [1:0] = 01 sets PE on output Port C to low pre-emphasis. PE_C [1:0] = 10 sets PE on output Port C to mid pre-emphasis. PE_C [1:0] = 11 sets PE on output Port C to high pre-emphasis.
PE1_C	Pre-emphasis MSB for C	
LB_A	Loopback enable for A	0 sets Port A in normal mode. 1 sets Port A in loopback mode.
LB_B	Loopback enable for B	0 sets Port B in normal mode. 1 sets Port B in loopback mode.
LB_C	Loopback enable for C	0 sets Port C in normal mode. 1 sets Port C in loopback mode.

[1] Note that the select function is controlled on a lane-by-lane basis, whereas the rest of the features are set on a port-by-port basis.

POWER CONNECTOR

The AD8159 evaluation board is supplied with a power cable. The individual conductors in the power cable are color coded as described in Table 2.

All supplies can be connected to a common 3.3 V supply or can be connected to separate supplies to monitor independent supply currents. Jumpers are provided to connect VTTOI to either VTTI or VTTO (W1), VTTIO to either VTTI or VTTO (W2), DVCC to VCC (W3), DVEE to VEE (W4), VTTI to VCC (W6), and VTTO to VCC (W7). W5 shorts the level-shifting diode, CR5, and should not be removed. The power connector pin assignments and jumper pin assignments are illustrated in Figure 3.

Table 2. Power Cable Summary

Power Supply	Color	Description
VCC	Red	Core supply
VEE	White	Return for core and term
VTTI	Yellow	Input termination supply (Port A and Port B)
VTTO	Green	Output termination supply (Port A and Port B)
VTTIO	Orange	Input/output termination supply for Port C
VTTOI	Blue	Output/input termination supply for Port C
GND	Black	Reference plane supply
DVCC	Gray	Pull-up supply for toggle switches
DVEE	White	Pull-down supply for toggle switches

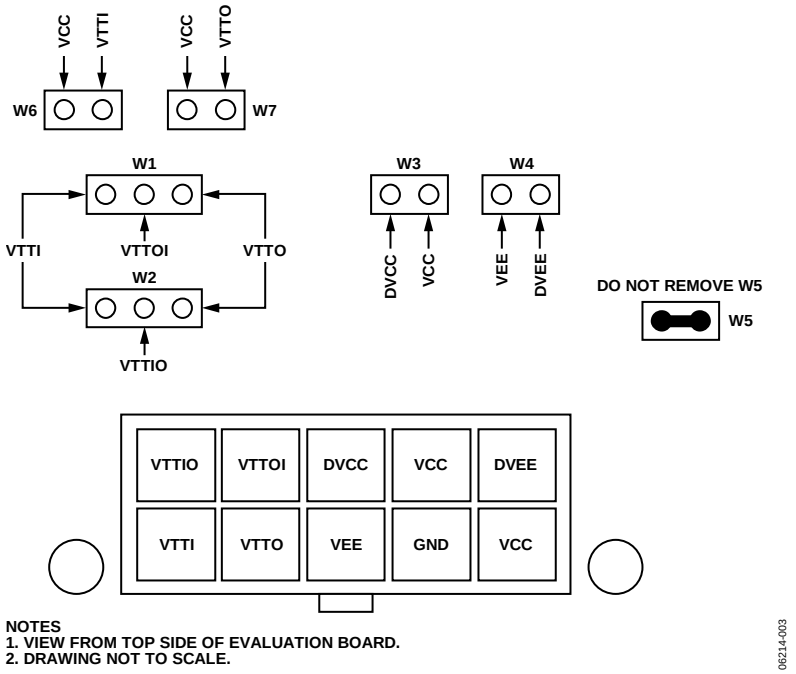

Figure 3. Power Connector and Jumper Diagram

POWER SUPPLY CONFIGURATIONS

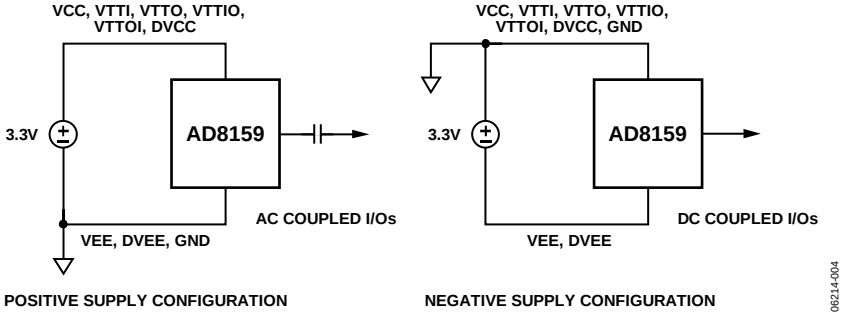

Figure 4. Positive and Negative Power Supply Configurations

The differential I/O signals are routed on microstrips on the top layer of the board. Trace widths, spacing, and dielectric thickness were designed for a 100 Ω differential impedance. The reference plane (GND) is not electrically connected to VEE, allowing the board to be configured with either positive or negative supplies. The negative supply configuration is useful when connecting the AD8159 to test equipment that has a 50 Ω termination to GND. The positive and negative supply configurations are illustrated in Figure 4.

AD8159 EVALUATION BOARD NOTE

An issue with uncorrelated chatter may be observed at the outputs of active lanes if the corresponding inputs are left unconnected. This can lead to crosstalk in adjacent lanes.

Explanation

The high sensitivity of the receiver causes the device to amplify noise if the inputs are left unconnected (floating).

Solution

Install a 1 kΩ to 2 kΩ pull-down resistor from one side of the unused differential pairs (P or N) to VEE. This adds a static offset voltage (nonzero differential input voltage) and prevent the output from toggling.

Pads for 0402-size resistors are available on the AD8159 evaluation board, but the resistors are not populated. Pull-down resistors should not be installed on active channels because a static offset voltage at the input induces duty-cycle distortion (DCD).

ORDERING INFORMATION

ORDERING GUIDE

Model	Description
AD8159-EVAL-DC	AD8159 DC-Coupled Evaluation Board
AD8159-EVAL-AC	AD8159 AC-Coupled Evaluation Board

ESD CAUTION

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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